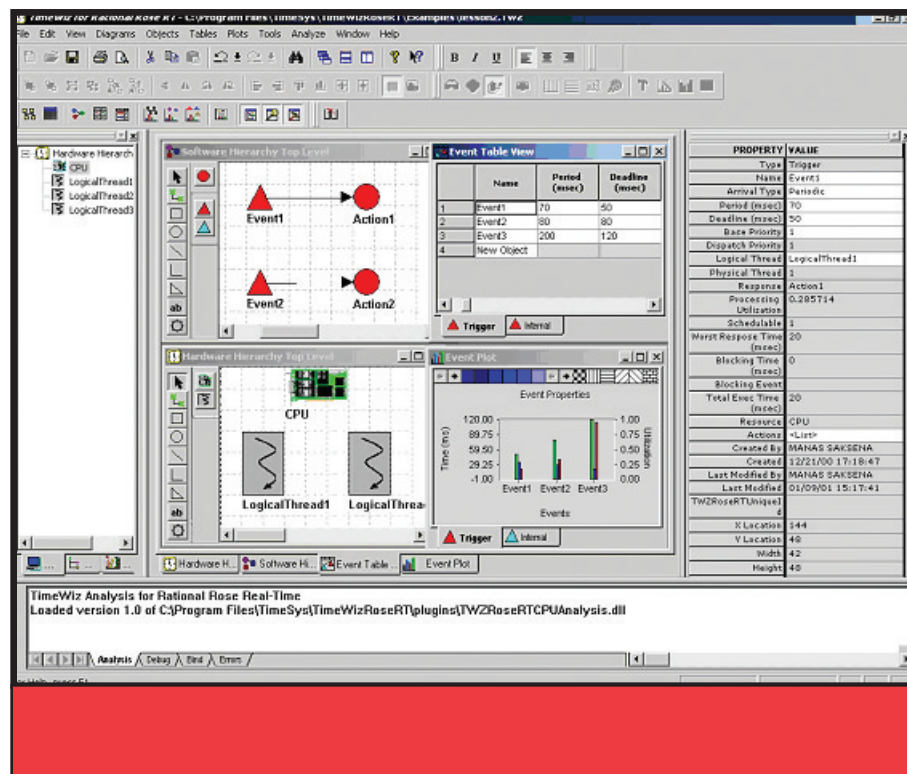# Air Force Research Laboratory | AFRL

Science and Technology for Tomorrow's Aerospace Forces

Success Story

TEMPORAL ANALYSIS CAPABILITY ENHANCES REAL-TIME UNIFIED MODELING LANGUAGE TOOL

Working in conjunction with Information Directorate researchers under a Ballistic Missile Defense Organization-funded Small Business Innovation Research Phase II contract and through other private funding, TimeSys Corporation developed a commercial product called TimeWiz® for Rational Rose Real-Time. The product provides a complete solution for developing timing-sensitive embedded systems and fully integrates unified modeling language (UML)-based modeling, automatic code generation, and global timing analysis, to improve software development.

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Accomplishment

This research commercialized a valuable combination of UML-based design and time-sensitive analysis capabilities supporting rate monotonic analysis (RMA) within UML models with an underlying event-driven execution paradigm. RMA is a collection of quantitative methods and algorithms that allows engineers to specify, understand, analyze, and predict the timing behavior of real-time software systems, thus improving their dependability and development.

Background

A TimeWiz® design/analysis model consists of models of resource architecture, software architecture, and a mapping of software architecture elements to the resources. The tool is useable in the early stages of architecture analysis to model the real-time software architecture of a system by focusing only on aspects relevant for performance modeling.

During later stages when an engineer builds a model of software architecture in Rational Rose Real-Time, engineers can automatically import it into TimeWiz®. Users can specify the timing requirements and assumptions for analysis purposes when using this software's architecture modeling.

By changing various properties, users can also perform "what-if" analyses. The synthesis engine of the tool computes scheduling attributes (priorities) for elements in the design model in order to meet the response time requirements. The synthesis engine can also optimize the mapping from logical threads to physical threads.

TimeSys Corporation engineers employed user feedback from developers like Lockheed Martin Aeronautics Company in the development of this integrated computer aided software engineering (CASE) capability. The resulting package represents a significant advancement as it has commercialized laborsaving CASE capabilities that address key Department of Defense needs. Lockheed Martin plans to employ integrated UML/RMA CASE tools on major avionics software development programs in the near future.

Information
Technology Transfer

Additional information